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FIG.1

FIG.2

121

122

PORTABLE
TERMINAL 105

123

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FIG.3

COUPON SUB DATA

TERMINAL DISPLAY
SCREEN DESCRIPTOR
(DESCRIBED BY C-HTML,
FOR EXAMPLE)

COUPON MAIN DATA

| COUPON ID |
| EXPIRATION DATE |
| COPY CONTROL INFORMATION |
| ISSUED STORE |
| ISSUED TIME |

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FIG.4

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FIG.5

403   404

| USER MANAGEMENT INFORMATION MEMORY UNIT | COUPON MANAGEMENT INFORMATION MEMORY UNIT |

COUPON PROCESSING UNIT ～402

ETHERNET INTERFACE UNIT ～401
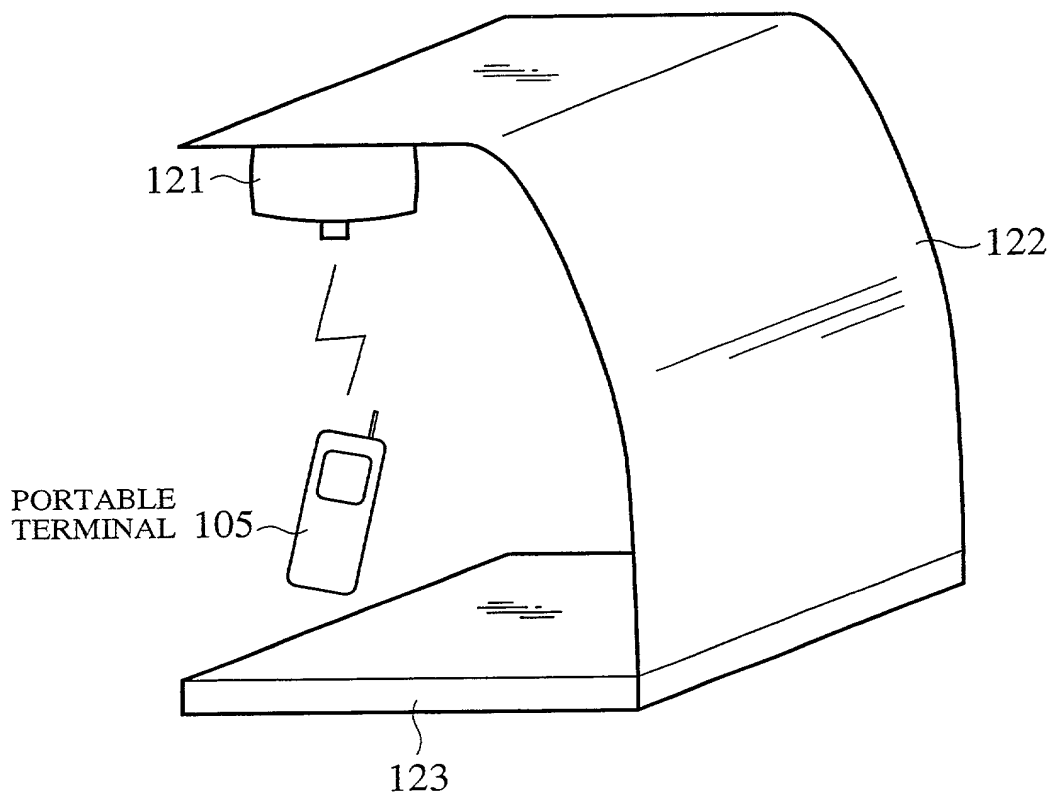
FIG.6

USER ID	USER ATTRIBUTE INFORMATION	TERMINAL ID	SERVICE INFORMATION
⋮	⋮	⋮	⋮

FIG.7

503

504

| ELECTRONIC COUPON STORAGE UNIT |

| DISPLAY UNIT |

| COUPON PROCESSING UNIT | ~502

| RADIO INTERFACE UNIT | ~501

FIG.8

111

112

| COUPON SEND BUTTON |

| COUPON COLLECT BUTTON |

| COUPON PROCESSING UNIT | ~114

| ETHERNET INTERFACE UNIT | ~113

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FIG.9

COUPON SERVER	REGISTER	RADIO BASE STATION	PORTABLE TERMINAL

S1

COUPON SEND BUTTON PRESSING OPERATION BY STORE CLERK

S2 — COUPON SENDING PROCESSING START COMMAND

S3 — ID TRANSMISSION REQUEST

S4 — ID TRANSMISSION (ID = X)

USER REGISTRATION CONFIRMATION REQUEST (ID = X) — S5

S6 — CONFIRMATION PROCESSING

S7 — USER REGISTRATION CONFIRMATION

S8 — SERVICE DISCOVERY REQUEST (COUPON SERVICE)

S9 — SERVICE RESPONSE (COUPON SERVICE EXISTS)

S10 — INQUIRY FOR COUPONS TO BE SENT (ID = X)

S11 — LIST OF COUPONS TO BE SENT (COUPON ID = A,B,C)

S12 — DISPLAY FORMAT INQUIRY

S13 — DISPLAY FORMAT RESPONSE (DISPLAY FORMAT = C-HTML)

S14 — ELECTRONIC COUPON DATA PRODUCTION PROCESSING

S15 — COUPON SENDING (A,B,C)

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FIG.10A

COUPON (P)

SIGNATURE
FOR ABOVE
COUPON
(e.g.[f(p)]Kp)

FIG.10B

COUPON (P)

SIGNATURE
FOR ABOVE
COUPON
(e.g.[f(p),x]Kp)

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FIG.11

START

PRODUCE TICKET PORTION
OF ELECTRONIC COUPON
ACCORDING TO COUPON ID —S21

CARRY OUT HASH FUNCTION
CALCULATION OF COUPON
MAIN DATA SECTION IN —S22
TICKET PORTION OF
ELECTRONIC COUPON

ACQUIRE KEY DATA —S23

S24
SHOULD
TERMINAL ID BE   NO
ALSO USED
?

YES

PRODUCE ELECTRONIC
SIGNATURE PORTION BY
ENCRYPTING HASH VALUE —S25
& TERMINAL ID BY USING
ACQUIRED KEY

S26
PRODUCE ELECTRONIC
SIGNATURE PORTION
BY ENCRYPTING HASH
VALUE BY USING
ACQUIRED KEY

COMPLETE ELECTRONIC
COUPON BY ATTACHING
ELECTRONIC SIGNATURE —S27
PORTION TO TICKET
PORTION OF ELECTRONIC
COUPON

END

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FIG.12

¥50 OFF
FOR EVERY ICECREAM !

VALID FROM
JAN.1,2000 UNTIL JAN.15,2000,
AT ALL ×× × STORES

~105

~151

| 1 | 2 | 3 |
| 4 | 5 | 6 |

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FIG.13

S31 — INITIAL SCREEN

S32

COUPON DISPLAY BUTTON PRESSED BY USER?   NO

YES

S33 — DISPLAY FIRST COUPON

S34

COUPON DISPLAY BUTTON PRESSED BY USER AGAIN?   NO

YES

S35 — DISPLAY NEXT COUPON

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FIG.14

```
        ┌─────────┐
        │  START  │
        └────┬────┘
             │
             ▼         ╭S41
          ╱────────╲
         ╱  WITHIN  ╲    NO      ┌──────────────────────┐
        ╱   VALID    ╲──────────▶│  DISPLAY IT ALONG     │
        ╲ PERIOD OF  ╱           │  WITH ALARM SOUND     │
         ╲ THAT     ╱            │  OR DELETE IT FROM    │──S43
          ╲COUPON? ╱             │  ELECTRONIC COUPON    │
           ╲──────╱              │  STORAGE UNIT         │
             │                   └──────────────────────┘
             │ YES
             ▼
        ┌──────────────┐
        │  DISPLAY IT  │──S42
        └──────────────┘
```

FIG.15

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FIG.16

COUPON SERVER   REGISTER   RADIO BASE STATION   PORTABLE TERMINAL

S201 COUPON SEND BUTTON PRESSING OPERATION BY STORE CLERK

S202 COUPON COLLECTING PROCESSING START COMMAND

S203 ID TRANSMISSION REQUEST

S204 ID TRANSMISSION (ID = X)

S205 USER REGISTRATION CONFIRMATION REQUEST (ID = X)

S206 CONFIRMATION PROCESSING

S207 USER REGISTRATION CONFIRMATION

S208 SERVICE DISCOVERY REQUEST (COUPON SERVICE)

S209 SERVICE RESPONSE (COUPON SERVICE EXISTS)

S210 DISPLAY FORMAT INQUIRY

S211 DISPLAY FORMAT RESPONSE (DISPLAY FORMAT = C-HTML)

S212 COUPON SENDING REQUEST (ID = X, DISPLAY FORMAT = C-HTML)

S213 ELECTRONIC COUPON DATA PRODUCTION PROCESSING

S214 COUPON SENDING (A,B,C)

S215 COUPON SENDING (A,B,C)

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FIG.17

ETHERNET 1210

REGISTER
1201

RADIO BASE STATION (REGISTER)
1101

RADIO BASE STATION (DOORWAY)
1102

RADIO BASE STATION (MAGAZINES)
1103

RADIO BASE STATION (HOUSEHOLD SUPPLIES)
1104

RADIO BASE STATION (GROCERY)
1105

RADIO BASE STATION (CONFECTIONERY)
1106

RADIO BASE STATION (BAKERY)
1107

RADIO BASE STATION (DRINKS)
1108

RADIO BASE STATION (DELICATESSEN)
1109

INFORMATION MANAGEMENT SERVER (BACK CORNER)
1202

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FIG.18

☆ : RADIO BASE STATION

DOORWAY 1102

1103

1101

CASHIER (REGISTER)

PORTABLE TERMINAL 1100

MAGAZINES CORNER

HOUSEHOLD SUPPLIES CORNER

GROCERY CORNER

1105 1104

DELICATESSEN CORNER

1109

CONFECTIONERY CORNER

BAKERY CORNER

1107 1106

1108

DRINKS CORNER

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FIG.19

¥ 10,000

1201

1101

1090

CASHIER'S TABLE

ETHERNET 1210

INFORMATION
MANAGEMENT
SERVER

1202

(POSITIOND AT
BACK CORNER)

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FIG.20

1111

1112

1100

1113

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FIG.21

1102

DOORWAY

PORTABLE
TERMINAL
1100

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FIG.22

```
┌─ COUPON SUB DATA ─┐
│                                         │
│   TERMINAL DISPLAY                      │
│   SCREEN DESCRIPTOR                     │
│  ( DESCRIBED BY C-HTML, )               │
│    FOR EXAMPLE                          │
│                                         │
├─────────────────────────────────────────┤
│              COUPON ID                   │
├─────────────────────────────────────────┤
│            EXPIRATION DATE               │
├─────────────────────────────────────────┤
│             ISSUED STORE                 │
├─────────────────────────────────────────┤
│              ISSUED TIME                 │
└─────────────────────────────────────────┘
```

COUPON SUB DATA

COUPON MAIN DATA

TERMINAL DISPLAY SCREEN DESCRIPTOR (DESCRIBED BY C-HTML, FOR EXAMPLE)

COUPON ID

EXPIRATION DATE

ISSUED STORE

ISSUED TIME

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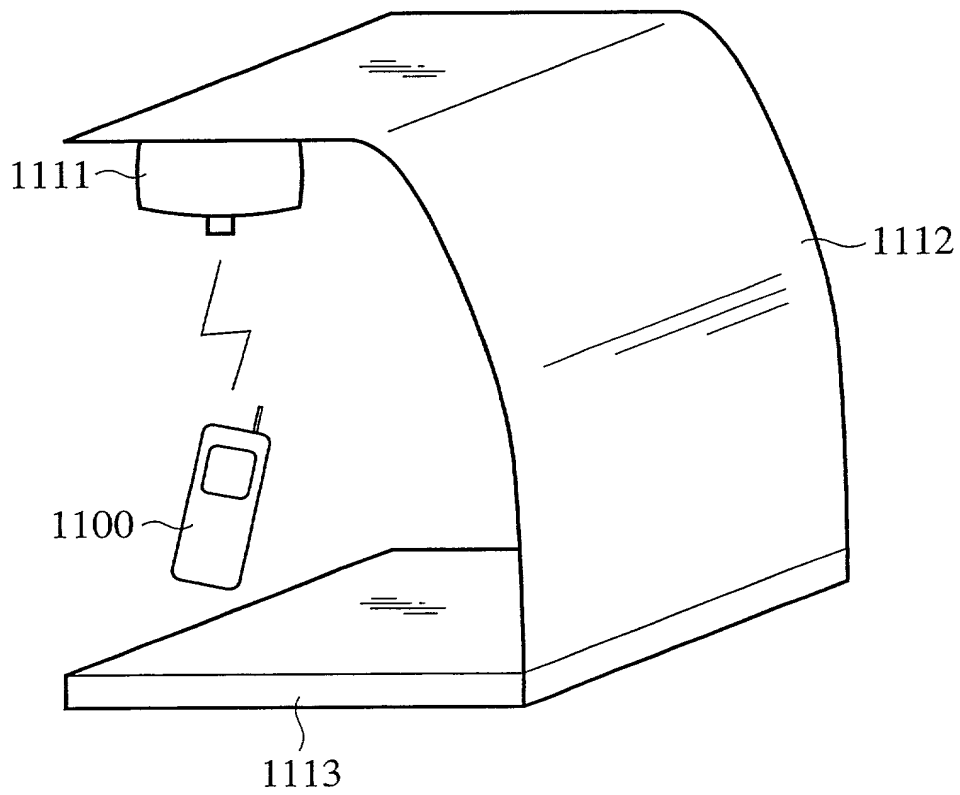
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FIG.23

TERMINAL ID	USER ATTRIBUTE INFORMATION (NAME,ADDRESS,AGE,SEX,ETC.)	TIME	PLACE	IDs OF SENT/COLLECTED COUPONS	PURCHASED ITEM
×	GEORGE BUSH 2001 42ND ST., MANHATTAN 30, MALE	T_1	DOORWAY	A(SENT)	
		T_2	DRINKS		
		$T_2 + \alpha$	DRINKS		
		$T_2 + 2\alpha$	DRINKS		
		T_3	REGISTER	B(COLLECTED)	××CORP. OOLONG TEA

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FIG.24

INFORMATION MANAGEMENT SERVER	RADIO BASE STATION (DOORWAY)	PORTABLE TERMINAL

DETECTION OF ENTERING PORTABLE TERMINAL $(t=T_1)$ — S301

ID TRANSMISSION REQUEST S302

ID TRANSMISSION (ID=X) S303

USER REGISTRATION CONFIRMATION REQUEST (ID=X, $t=T_1$) S304

CHECKING WHETHER USER X IS REGISTERED OR NOT — S305

USER REGISTRATION CONFIRMATION S306

RECORDING THAT USER X IS LOCATED AT DOORWAY ON $t=T_1$ — S307

SERVICE DISCOVERY REQUEST (COUPON SERVICE) S308

SERVICE RESPONSE (COUPON SERVICE EXISTS) S309

DISPLAY FORMAT INQUIRY S310

DISPLAY FORMAT RESPONSE (DISPLAY FORMAT = C-HTML) S311

COUPON SENDING REQUEST (ID = X, DISPLAY FORMAT = C-HTML) S312

OBTAINING COUPON FOR ID = X — S313

COUPON SENDING (A) S314

COUPON SENDING (A) S315

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FIG.25

INFORMATION MANAGEMENT SERVER	RADIO BASE STATION (DRINKS)	PORTABLE TERMINAL

DETECTION OF ENTERING PORTABLE TERMINAL (t=T_2) — S321

ID TRANSMISSION REQUEST — S322

ID TRANSMISSION (ID=X) — S323

WAITING FOR TIME Tx — S324

Ping (EXISTENCE CONFIRMATION) — S325

Ping RESPONSE — S326

USER REGISTRATION CONFIRMATION REQUEST (ID=X) (t=T_2) — S327

CHECKING WHETHER USER X IS REGISTERED OR NOT — S328

USER REGISTRATION CONFIRMATION — S329

RECORDING THAT USER X IS LOCATED AT DRINKS CORNER ON t=T_2 — S330
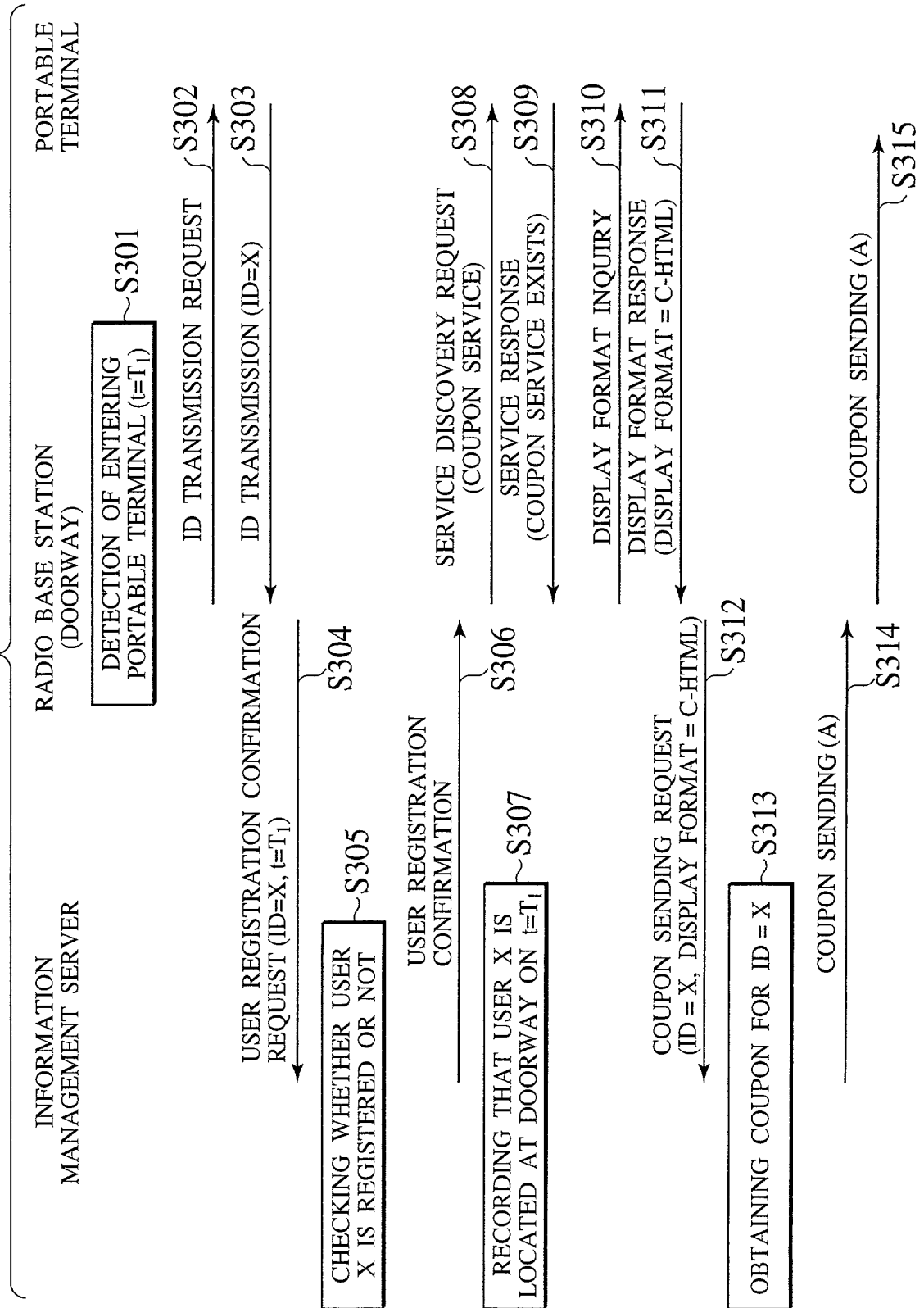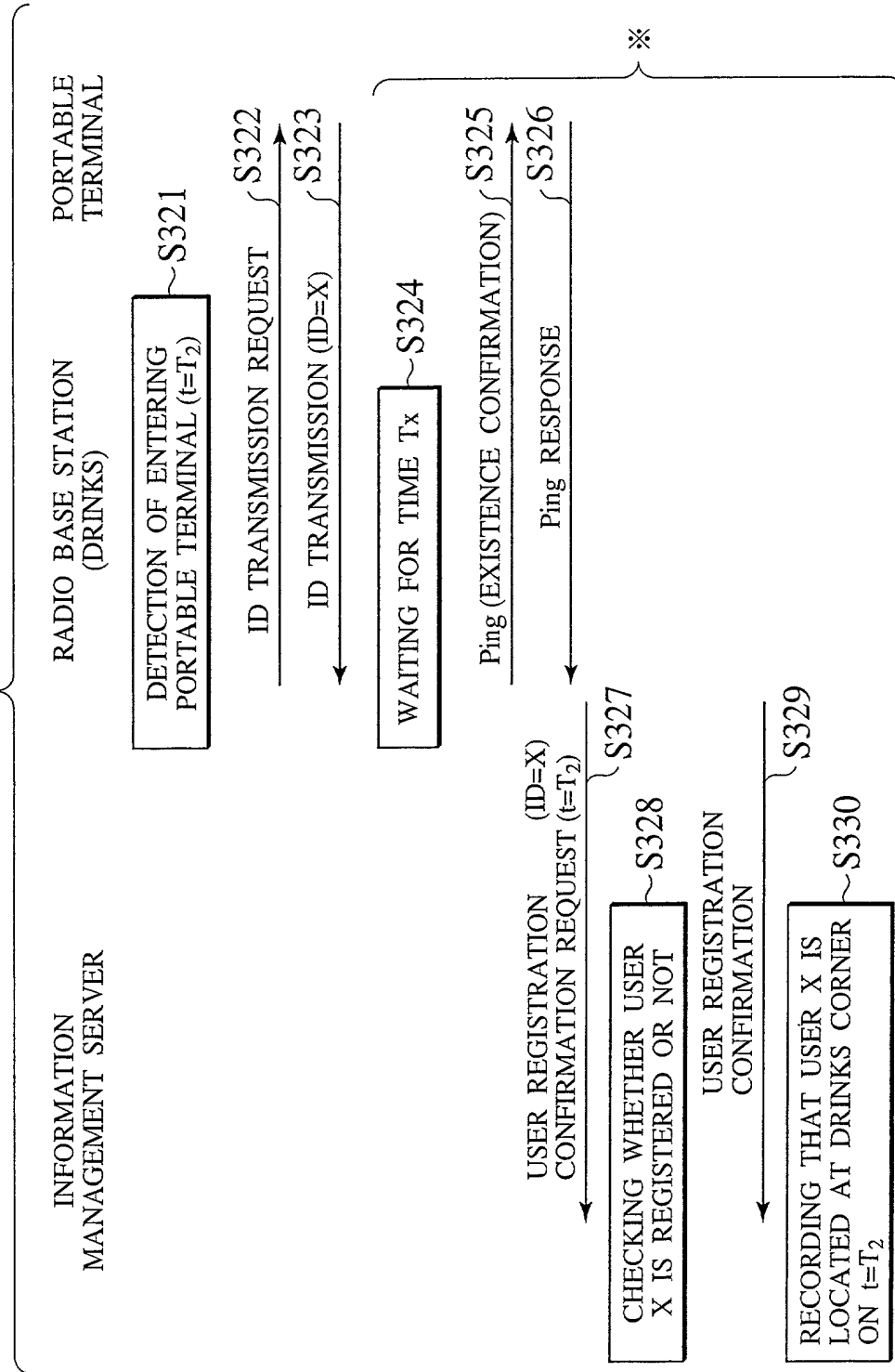
※ IS REPEATED AS LONG AS PORTABLE TERMINAL IS LOCATED WITHIN COVERED AREA

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FIG.26

| INFORMATION MANAGEMENT SERVER | REGISTER | RADIO BASE STATION (REGISTER) | PORTABLE TERMINAL |

DETECTION OF ENTERING PORTABLE TERMINAL (t=T₃) ~S341

ID TRANSMISSION REQUEST ~S342

ID TRANSMISSION (ID=X) ~S343

USER REGISTRATION CONFIRMATION REQUEST (ID=X) ~S344

CHECKING WHETHER USER X IS REGISTERED OR NOT ~S345

USER REGISTRATION CONFIRMATION ~S346

RECORDING THAT USER X IS LOCATED AT REGISTER ON t=T₃ ~S347

SERVICE DISCOVERY REQUEST (COUPON SERVICE) ~S348

SERVICE RESPONSE (COUPON SERVICE EXISTS) ~S349

COUPON COLLECTING REQUEST ~S350

COUPON COLLECTING RESPONSE (COUPON) ~S351

COUPON VALIDITY CONFIRMATION REQUEST(COUPON, X) ~S352

COUPON VALIDITY CONFIRMATION RESPONSE ~S353

COMMAND FOR DISCOUNT AS INDICATED BY COUPON ~S354

PURCHASED ITEM INFORMATION ~S355

RECORDING INFORMATION ON UTILIZED COUPON & PURCHASED ITEM ~S356

COUPON DELETION REQUEST ~S357

COUPON DELETION ~S358